PATENT SPECIFICATION

518,993

Convention Dates (Germany)

Sept. 15, 1937:
Dec. 8, 1937:
April 20, 1938:
May 25, 1938:
June 21, 1938:
Aug. 13, 1938.

Corresponding Applications in United Kingdom

No. 26900/38
No. 26901/38
No. 26902/38
No. 26903/38
No. 26904/38
No. 26905/38

dated Sept. 15, 1938.

(One Complete Specification Left under Section 91 (2) of the Patents and Designs Acts, 1907 to 1932.)

Specification Accepted: March 13, 1940.

COMPLETE SPECIFICATION

Process and Apparatus for Anodising Thin Wire

I, FRITZ DÜRR, a German Citizen, of Jänisch Allee 4, Berlin-Friedenau, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process and apparatus for anodising thin wire of light metal.

It is known to protect metals, especially light metals, such as aluminium and magnesium, from the influences of the atmosphere by providing them with a layer of oxide. It has repeatedly been tried to use the same means for thin wires, which if successful, would have furnished an ideal means to maintain the original silver-bright colour and thereby to render possible the use of this material for the manufacture of laces, braids and the like. Also in the electrical industry such electrolytically oxidised (anodised) thin wires could be widely employed by reason of the insulating property of the layer of oxide.

Up to now, however, all efforts to treat thin wires in this way have met with great difficulty, principally because thin wires become too strongly heated by the passage of the requisite current to give an adequate current density for anodic oxidation.

According to the method of the present invention, the wire which serves as anode is wound upon a supporting device which serves also for the supply of the current, the wire being oxidised electrolytically upon that supporting device. It is possible to obtain in this way the requisite current density without electrically overloading the wire.

The supporting device for the wire may be formed by a reel provided with projecting edges, whereby the wire wound upon it is subdivided into a plurality of pieces which are connected in parallel, the electrolytic oxidation being effected on the thus subdivided wire. The reel consists, as a rule, of aluminium or another suitable light metal and is connected up to the source of current. The current is supplied to the wire at the numerous places of contact between the wire and the edges of the reel, so that it only has to pass through short lengths of the wire.

Since the electrolytic oxidation is effected around the places of support, quite strongly, subsequent colouration does not enable the discontinuity of the anodic layer to be detected and this despite the fact that the places of support remain electrically conductive, it is therefore, in many cases, not necessary to wind the wire upon a reel with projecting edges, but to employ instead thereof a roller-like supporting member having a cylindrical surface, the wire being wound upon this surface in such a manner that it contacts therewith along its entire length.

Thus, the method of the present invention may be carried out by winding the entire length of wire upon the supporting device, such as a reel or a roller, and placing the reel or roller with the wire thereon into the electrolytic bath, but this method cannot be carried out continuously, and necessitates a rather large number of reels or rollers. A continuous operation is, however, rendered possible by winding the wire upon the reel or roller continuously either in one turn or in a plurality of turns while the supporting member is being rotated, one or more guide members being provided to regulate the winding-on, the winding-off and the progressive movement of the wire on the supporting member. The method can also be carried out with the winding-on place and the winding-off place of the

[Price 1/-]

wire always at the same places in the bath by giving the reel or roller an axial movement which corresponds with the pitch of the wire on the reel or roller, or with the progressive movement of the wire thereon. This procedure presents the advantage that the electrolytic oxidation of the wire can be carried out continuously without the wire being subjected to mechanical stresses by lateral shifting upon the supporting member.

In another modification of the method, the wire to be treated is wound upon spools having several supporting members which are assembled as winding takes place forming, in effect, superimposed supporting layers. When a layer of wire has been wound on the innermost supporting member, another supporting member is mounted over this and a layer of wire wound upon it in turn and so on. By thus arranging several layers of wire upon one spool, the capacity of the electrolysing baths can be fully utilised.

There are cases possible in which knotting the wire is no hindrance to the further working procedure carried out according to this invention, in such cases also the use of supporting devices composed of several concentric members is advantageous because the space which the spools occupy in the bath is only slight in spite of the greater length of the wires. In this case the separate reels can be wound with the wire and can be assembled to one structure immediately before being dipped into the bath. The ends of the wound wire sections can be connected together either before or after oxidation. A connection of the wires to a source of current is unnecessary because the whole supporting device serves to carry current.

On carrying out the method of this invention the places where the wires and the supporting member contact with one another are left without a layer of oxide. For many uses of the wire, this is without importance, because it is frequently possible to keep these parts concealed, e.g. by arranging them on the rear side of a fabric containing the wire, so that any darkening is unnoticed. But there are also other cases in which this is not permissible. In such cases, it is desirable and quite possible to oxidise these places which are nearly always quite small in area by comparison with the main portion already oxidised. Accordingly, quite a small current will suffice to give the requisite current density for anodic oxidation of these places, bearing in mind that the surface portions already oxidised are at most only very slightly. This supplementary anodising need not therefore, be carried out while the wire is on a supporting member. By simply subjecting the wire to anodic oxidation in normal manner while unsupported the remaining bright places are covered by an oxide film without any excessive heating of the wire by the current. Thus, by the present invention, it is possible to provide thin wires with a complete covering by electrolytic oxidation.

In the accompanying drawing I have shown diagrammatically and by way of example several constructional forms of devices designed for carrying out the present improved method. In these drawings

Figure 1 is an elevation of a wire and of a reel upon which said wire has been wound,

Figure 2 is an end view of this reel,

Figure 3 is a front elevation partly in section of a form of apparatus for carrying out the oxidation continuously,

Figure 4 is a front elevation partly in section of the apparatus shown in Figure 3.

Figure 5 is a front sectional view of another form of apparatus, in which the supporting member for the wire is axially movable.

Figure 6 is a front elevation of a form of apparatus upon which the wire is wound in several layers,

Figure 7 is a transverse section through the form of apparatus shown in Figure 6,

Figure 8 is a front sectional view of a form of apparatus designed for the reception of several spools.

Referring to Figure 1, 2 denotes the supporting member which is constituted in this case by a reel upon which the thin wire 1 is wound. This reel is so designed that the wire contacts with projecting edges 4 (Figure 2). The current is supplied to the member 2 through contacts 3. The wire is helically wound upon the reel. When this has been done, the reel with the wire thereon is placed into the bath, whereafter the electrolytic oxidation is effected. Obviously the method can be carried out also with another suitable supporting member instead of with a reel, for instance with a roller, a sieve drum or the like.

In order to carry out continuous treatment the wire can be wound on and off continuously while the supporting member is rotated at the same time. The reel 5 (Figures 3 and 4) is rotatably supported in the bearings 6 and is rotated by an electromotor 7 or the like. The wire 1 runs from the spool 8 over the reel 5 which dips into the bath 9 and is thereafter wound upon the spool 10. These

phases and the progressive movement of the wire are regulated by a stationary helical guide member 11 around the reel 5. The guide member can take the form of a helical spring made of a flat aluminium wire. The accurate spacing between the turns of the helical member 11 can be ensured by distance pieces (not shown). The inner faces of the turns of the member 11 are smooth and oxidised and the reel can turn freely in said member without any seizing. Instead of treating only one wire at the time, several can be introduced side by side into the guide member, in which case the spacing between the turns of the guide member must be appropriately larger.

The effect of the guide member is that the turns of wire upon the reel are moved axially from the winding-on point adjacent spool 8 to the winding-off point adjacent spool 10 so that the winding-on and winding-off points remain fixed. By revolution of the reel the wire dips repeatedly into the bath whereby the total length or period of time requisite for the proper oxidation can be obtained. The face of the reel is always covered and does not therefore, lose its conductivity by oxidation. The current can be supplied through the reel.

The strain to which the wire is subjected by the lateral movement upon the supporting member 5 during the passage thereover can be obviated by moving such member 5 (axially) during its rotation at a speed corresponding to the rate of travel of the wire axially of it. For this purpose stuffing boxes 12 and 13 (Figure 5) can be provided in the wall of the bath 9, to permit axial and rotational movement of the supporting member therein.

In Figure 5 the numeral 14 denotes the cylindrical supporting member, 15 is the spool from which the wire is wound off and 16 is the spool upon which the wire is wound after having been treated in the bath. When the supporting member has traversed the bath, its direction of rotation is reversed and the spools are interchanged. In case of breakage of the wire, to permit access to the broken ends, the member 14 can be so supported and/or the level of the bath can be kept on such a height, that its top portion projects out of the bath, i.e. above the level of liquid therein. A plurality of supporting members can be arranged side by side in a common bath.

In Figures 6, 7 and 8 are illustrated supporting members upon which several layers of wire can be wound one over another whereby the possibility is afforded to obtain a particularly good utilisation of the capacity of the bath. In the example shown in Figures 6 and 7 a central axle 19 is arranged between discs 17 and 18 having bores 20 which are preferably conical. The numeral 21 denotes reel bars, the ends of which are likewise conical so as to fit into the conical bores of the discs. Using this form of apparatus, a layer of wire is first wound on the inner rods shown (21) in full lines. Then another set of rods (shown in dotted lines) is inserted and a further layer of wire, wound on them, and finally still another set of rods upon which another layer of wire is wound. The direction of winding of the wire upon the consecutive sets or layers of the rods 21 changes from layer to layer. There may be more than three sets or layers of rods, if desired. The radial distance between the layers can be quite small so that a very large amount of wire can be accommodated in one bath.

In the example shown in Figure 8 there are two discs 23 and 24 which are rigidly connected with one another by rods 25. There are, furthermore, so-called cage-rings 29, 30 and 31 to which are attached sets of concentric rods 28, 27, 26 which are likewise intended to hold wire to be treated and which are held at their other ends by the rings 32, 33, 34. The disc 24 is conically stepped at the side facing the cage rings and these latter are correspondingly conical at their inner faces so as to be able to fit upon said disc 24. In using this form of apparatus, the set of rods 25 is supplied with wire and then the first ring 31 with rods 26 and the ring 34 is slid towards the ring 24 until the conical face of the ring 31 engages the oppositely located conical step of the ring 24 so that the cage becomes a conductor and is entrained by its cone coupling. Spooling now occurs in the reverse direction and the rods 26 are supplied with wire. After completion of spooling on to the rods 26 the cage ring 30 is displaced in the same way and wire is spooled on to the rods 27. This operation is repeated with the ring 29 and the rods 28.

The rings 29, 30, 31 may be provided with radial slots. They thus become resilient, and a secure contact of the contact surfaces of the separate rings is obtained by the tight frictional engagement of the rings with the discs so that the current can be conducted from the innermost reel to the outermost reel without oxidation at the places of frictional engagement due to the penetration of liquid from the bath. The slots also serve to guide the wire when passing from one spool to the next.

The reel rods 26, 27 and 28 may be

made removable so that any number of concentric layers of wire up to a maximum may be oxidised. Upon rotation of the members 24 and 23 the rings 29, 30 and 31 rotate therewith owing to engagement of the conical portions with one another, and for this reason also the current can pass to the wire, while the members concerned are being rotated in the bath. The ends of the individual portions of wire on the separate sets of rods are connected with one another prior to the assembly being inserted into the bath and rotated therein.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. The method for the anodising of thin wires of light metals, such as aluminium, magnesium and the like, in which the wire is wound upon a supporting device serving also for the supply of the current to the wire, and is electrolytically oxidised thereon.

2. The method as claimed in claim 1, in which the supporting device has a plurality of supporting edges whereby the wire is subdivided into a plurality of pieces which are connected in parallel with one another and are electrolytically oxidised while thus subdivided.

3. The method as claimed in claim 1 or 2, in which the wire is wound upon roller-like supporting members having a cylindrical surface, the wire being wound upon said surface in such a manner, that it contacts therewith along its entire length and is electrolytically oxidised in this position.

4. The method as claimed in any of the preceding claims, in which the wire is wound continuously in one or more turns over the supporting member while this is in rotation, the winding-off, the winding-on and the progressive movement of the wire being regulated during the time of treatment by a stationary guide member.

5. The method as claimed in any of claims 1—3, in which the wire is continuously wound upon a rotating supporting member and is wound off from the same in one or more turns, said member being moved axially in correspondence with the progressive movement of the wire while this is being wound off and on.

6. The method as claimed in claims 1—3, in which the wire is wound upon a reel-like supporting member and one or more additional reel-like supporting members are slid upon the first supporting member and are supplied with wire in the same manner as the first.

7. The method as claimed in claim 6, in which the individual and concentrically arranged supporting members receive individual sections of the wire, the ends of said sections being then knotted together so as to unite the wire sections thereon and the entire amount of the wire present is then subjected to the electrolytical oxidation.

8. The method as claimed in any of the preceding claims, in which the unoxidised parts of the wire at the places of support are subsequently oxidised by simple anodic treatment when the wire is not supported.

9. Apparatus for carrying out the method claimed in claim 7, having two discs adapted to support between them two or more concentric sets of removable or slideable reel rods destined to receive the wire to be treated.

10. Apparatus for carrying out the method claimed in claim 7, having two discs connected by rods forming an inner reel and further reels having a larger diameter formed of rings connected by rods which are adapted to be slideably displaced over the innermost reel, said rings being adapted to engage with one at least of the discs for rotation therewith for the passage of the thin wire, the arrangement being such that the individual reel rings can be connected conductively with conical counter-members for supplying the current to the wires on the said reels.

11. Apparatus as claimed in claim 10, in which the rings at one end of the connecting rods are conically shaped and provided with a radial slot for the passage of thin wire and one of the discs is correspondingly conically stepped for frictional engagement with the rings in order to enable the rods to be supplied with current and rotated together.

12. Apparatus as claimed in claim 10, in which the individual reel members are adapted to be held in tight frictional engagement with the discs so that the current can be conducted from the innermost reel to the outer reel or reels without oxidation at the places of frictional engagement.

13. Apparatus for carrying the method claimed in claim 4, in which for the regulation of the winding-on of the wire upon the supporting member, the winding-off from the same, and the progressive movement of the wire, a guide-path constituted by a stationary member of helical shape is provided, this member surrounding the supporting member for the wire.

14. Apparatus as claimed in claim 13, in which the guide member surrounding the supporting member for the wire con-

centrically is formed by a helically wound metal wire.

15. Process for the anodising of thin wire of light metal, substantially as herein described and illustrated by the accompanying drawings.

Dated this 14th day of September, 1938.

W. P. THOMPSON & CO.,
12, Church Street, Liverpool,
Chartered Patent Agents.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1940.

Fig.1

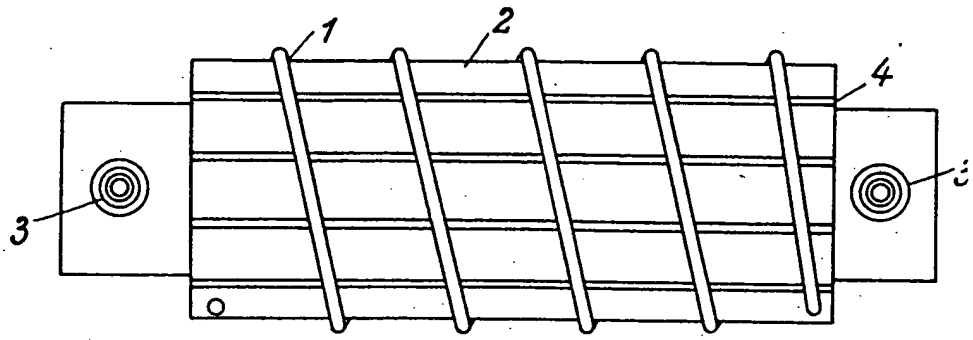


Fig.2

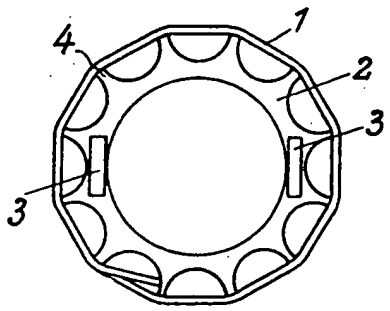


Fig. 3

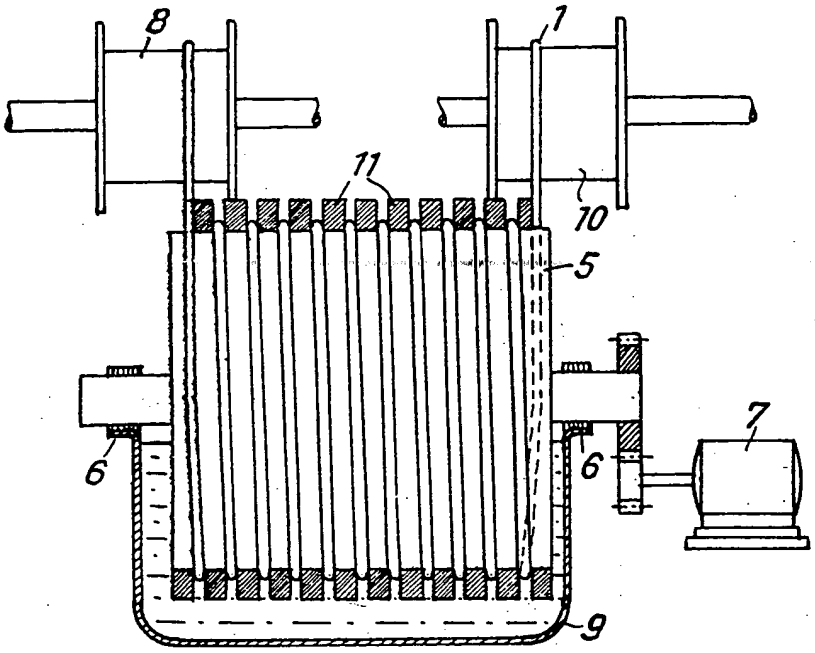
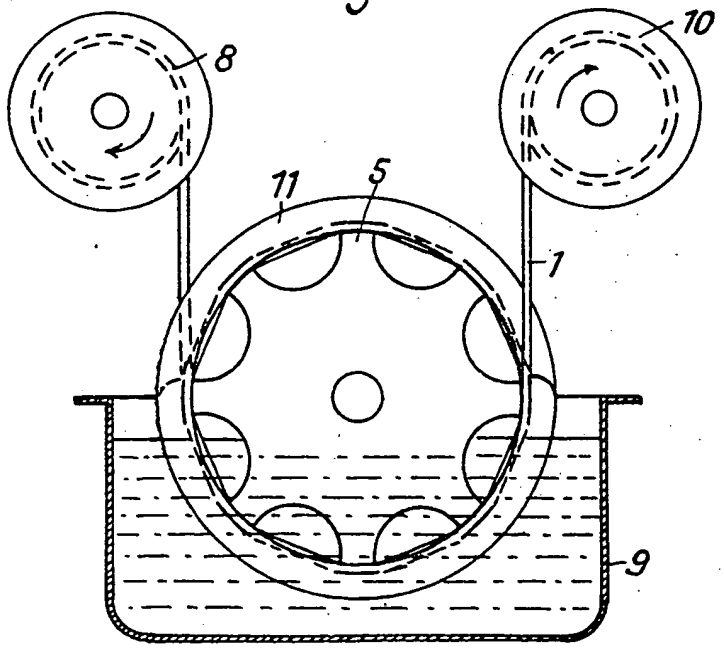


Fig. 4



Malby & Sons, Photo-Lith.

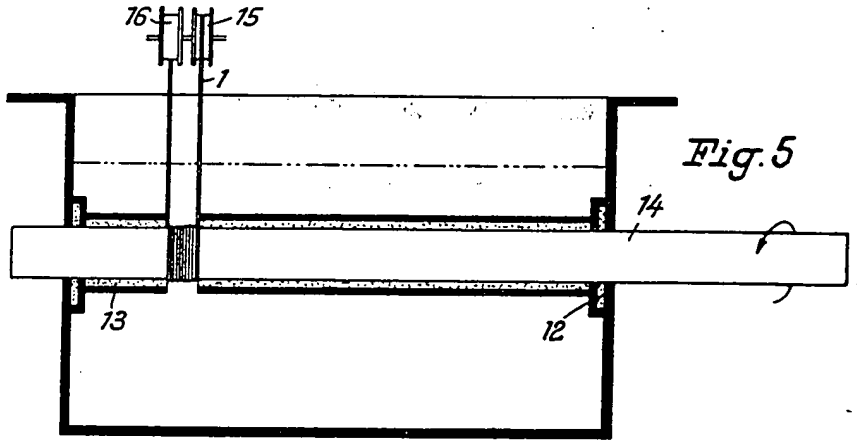


Fig. 5

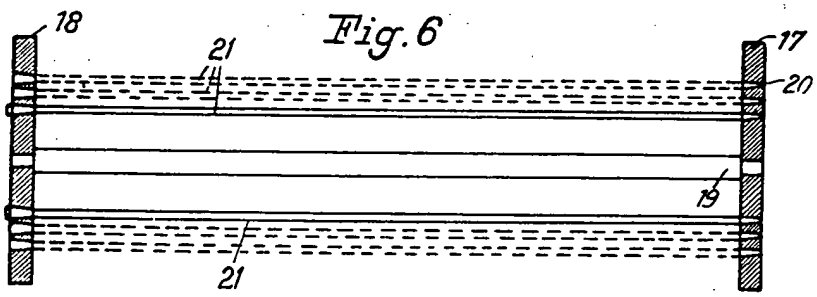


Fig. 6

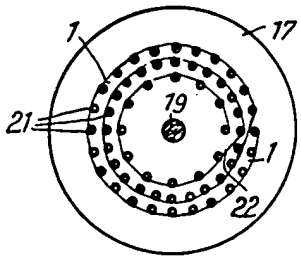


Fig. 7

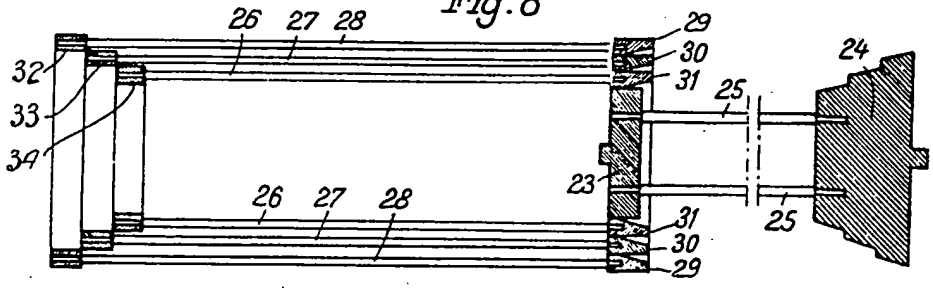


Fig. 8

Malby & Sons, Photo-Litho.